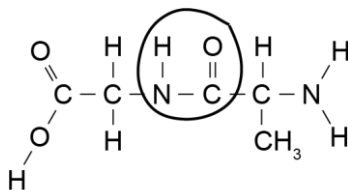
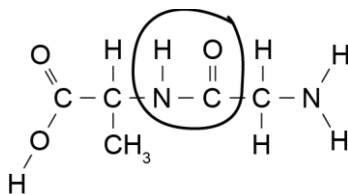
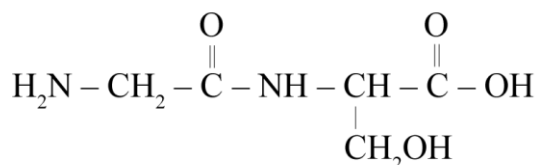
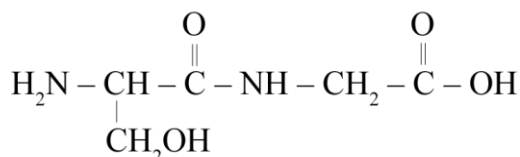


## ANSWERS: Amino Acids, Dipeptides, Tripeptides and Proteins

1) TWO correct structures drawn and amide linkages identified with circles.



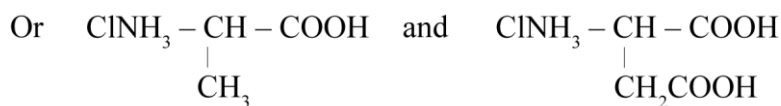
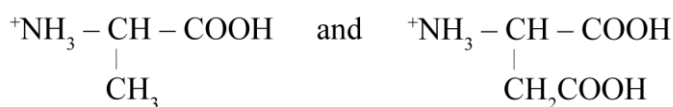
2a) i)



ii) Dipeptides contain the CO–NH (peptide/amide) linkage. This forms when the amine group of one molecule reacts with the carboxylic acid group of the other molecule. Two dipeptides are possible as either the COOH from glycine can react with the NH<sub>2</sub> from serine, or the NH<sub>2</sub> from glycine can react with the COOH from serine.

b) The amide link is hydrolysed in both acid and basic conditions.

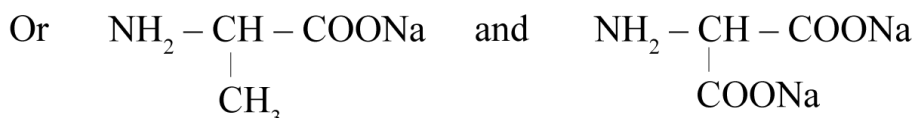
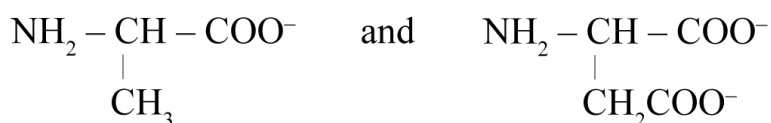
In acid conditions the product is:



The acid will form a salt with the amine group, NH<sub>2</sub>.

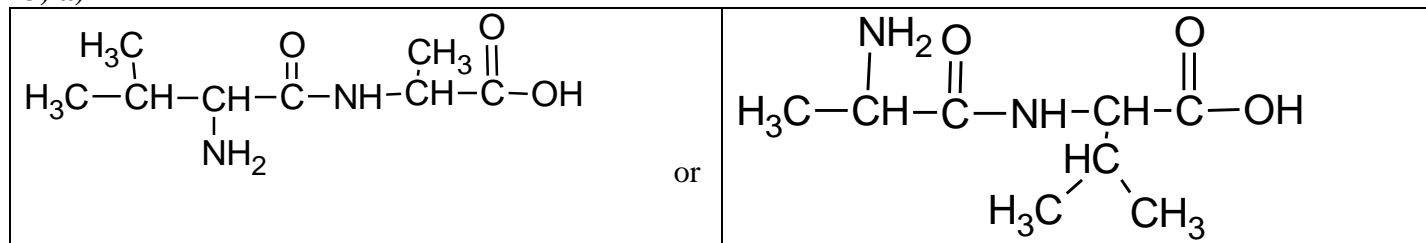
In acidic conditions the amino group will react with the acid as the amino group is a base and will therefore accept a proton and become NH<sub>3</sub><sup>+</sup>.

In basic conditions the product is:



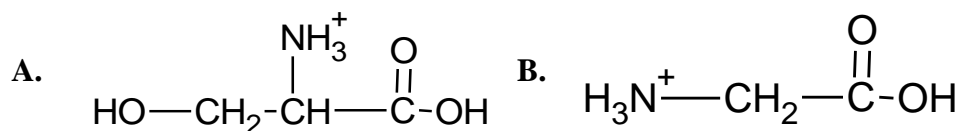
While in basic conditions the carboxyl group which is acidic will react by losing its hydrogen and would become a salt as acids and bases react to form salts.

3) a)

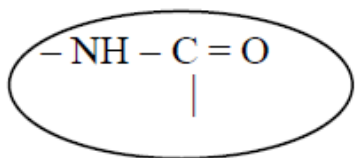
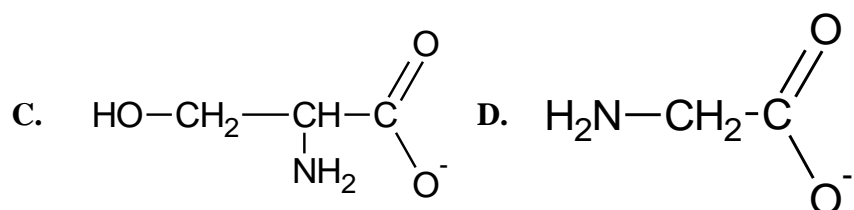


b) The amide linkage is hydrolysed with both acidic and basic hydrolysis.

i) Under acidic conditions the products would be:

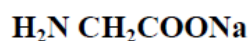
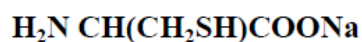
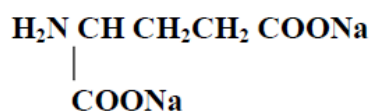


ii) Under alkaline conditions, the products would be:

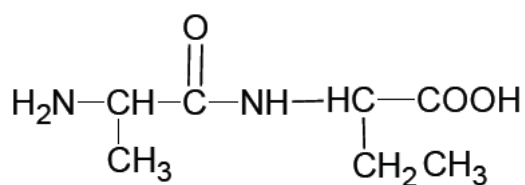
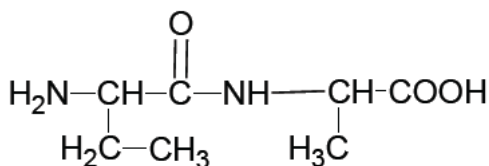


4)

Under **alkaline conditions** products would be



The structures above with  $\text{COO}^-$  instead of  $\text{COONa}$ , Under **acidic conditions** the  $\text{NH}_2$  group would be protonated (to  $\text{NH}_3^+$ ) in each case and  $\text{COOH}$  would be present instead of  $\text{COO}^- / \text{COONa}$ .



6) i)

ii) Condensation reaction results in removal of a small molecule OR water during the bonding reaction between the 2 molecules, in this case a water molecule is produced for every peptide bond formed. The OH is removed from the carboxylate or OH ends and the H is removed from the amine group.